Supplementary Material

1 MOTION STIMULI IN EACH OF THE DATSETS

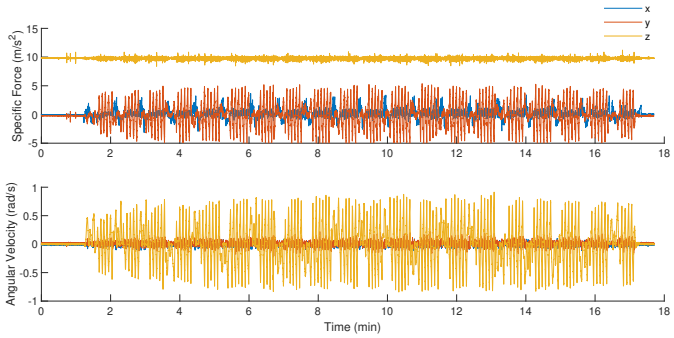

Figure S1. Slalom Drive dataset (Irmak et al., 2020) head specific forces and angular velocities for one participant

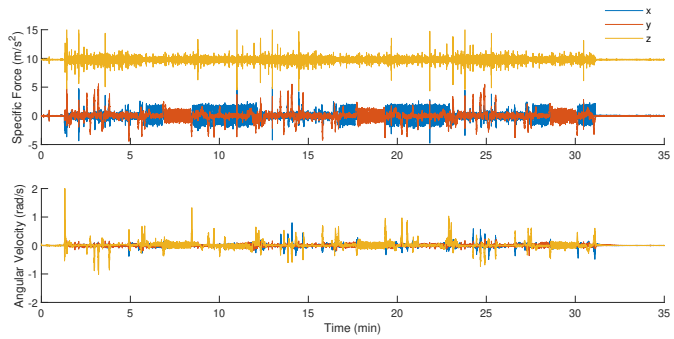

Figure S2. Car and Simulator dataset (Talsma et al., 2023) vehicle specific forces and angular velocities for one participant

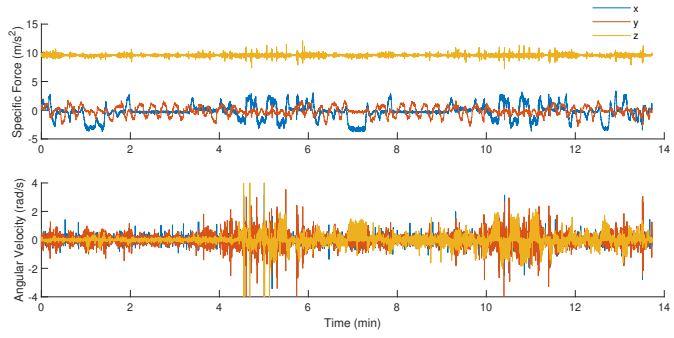

Figure S3. NDRT Drive dataset (Metzulat et al., 2024) vehicle specific forces and angular velocities for one participant

2 FITTING RESULTS FOR ALL DATA

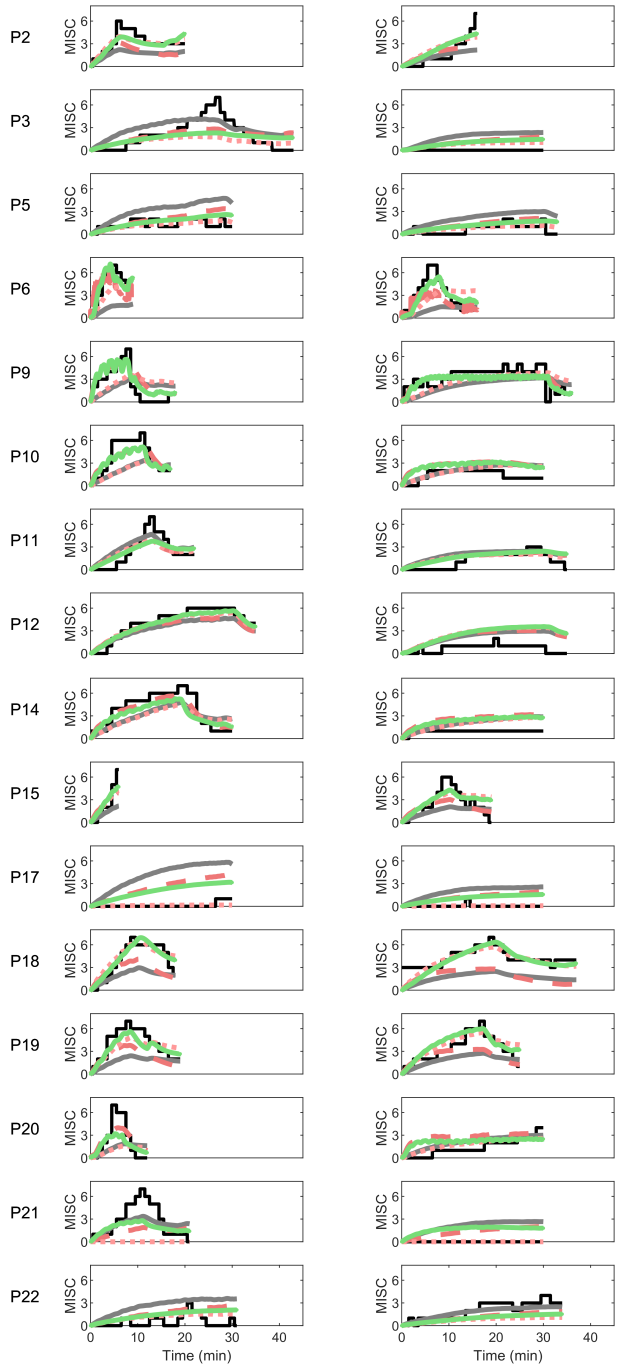

Figure 4a. AM0, AM1a, Am1b, AM2

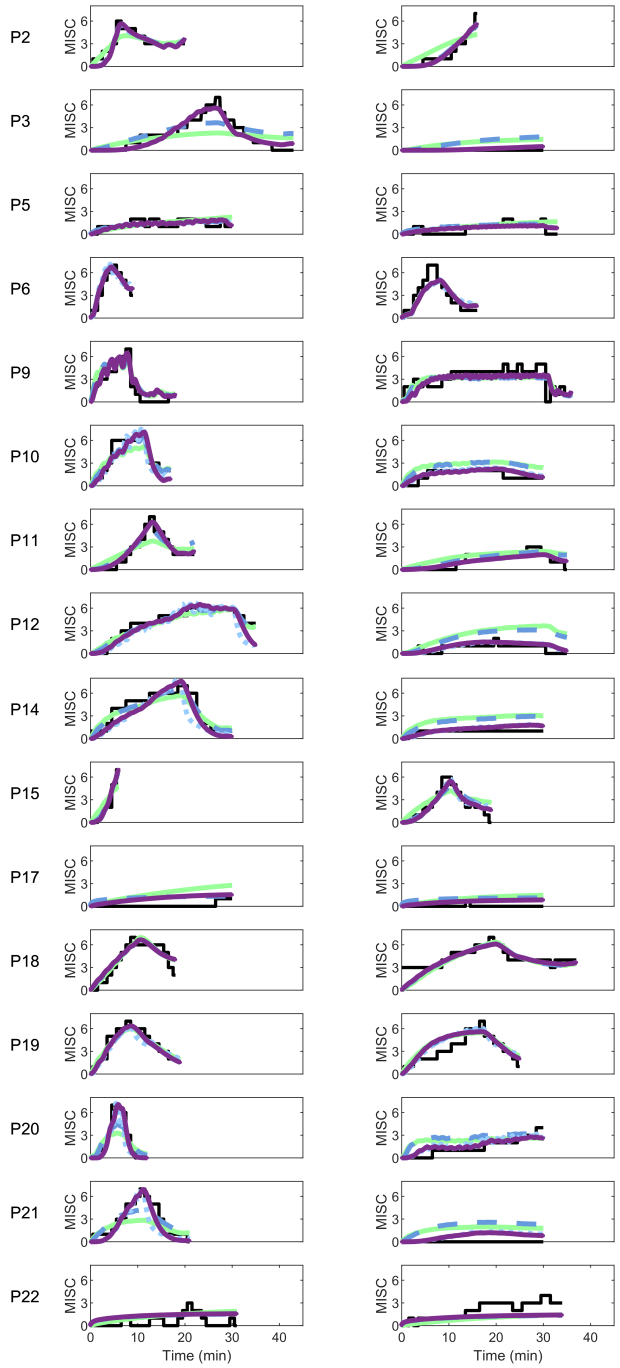

Figure 4b. AM3, AM4a, Am4b, AM5

Figure 4. Motion sickness responses (MISC) in Slalom Drive by Irmak et al. (2020); experiment in black, fitted AM0 in grey, AM1a in dashed red, AM1b in dotted light red, and AM2 in green, AM3 in light green, AM4a in dashed blue, AM4b in dotted light blue, and AM5 in violet for all participants (participant label shown on the left) for the conditions of internal (left column) and external (right column) vision.

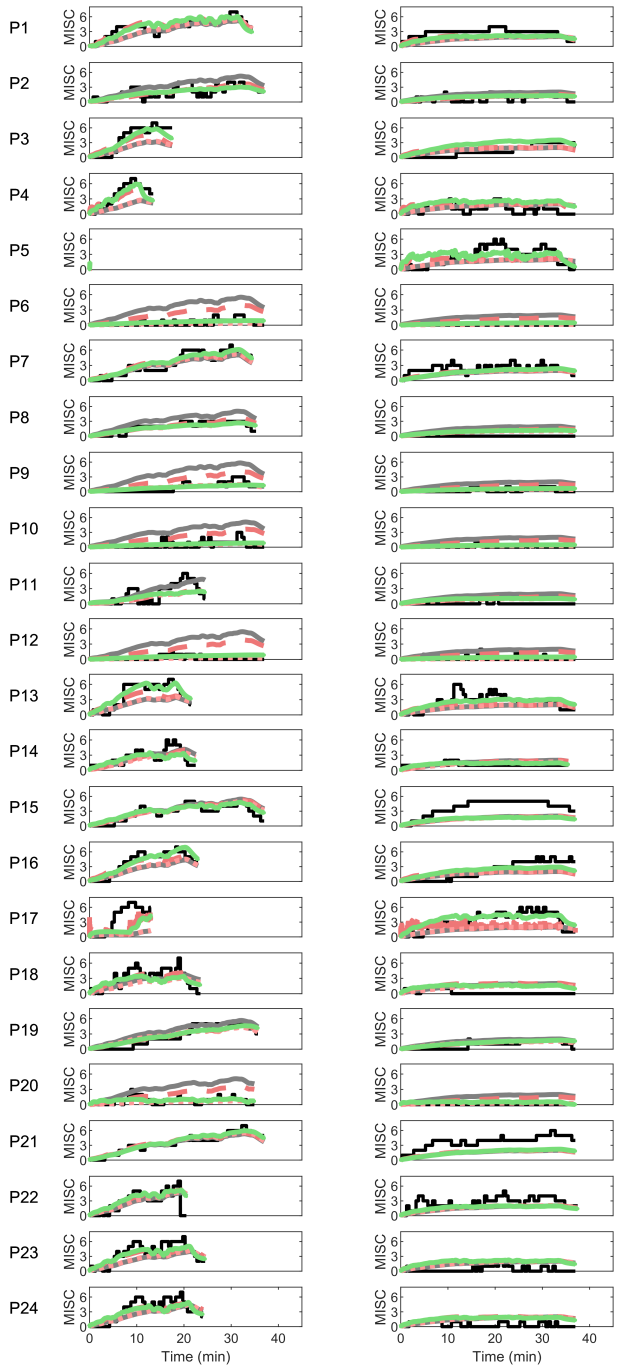

Figure 5a. AM0, AM1a, Am1b, AM2

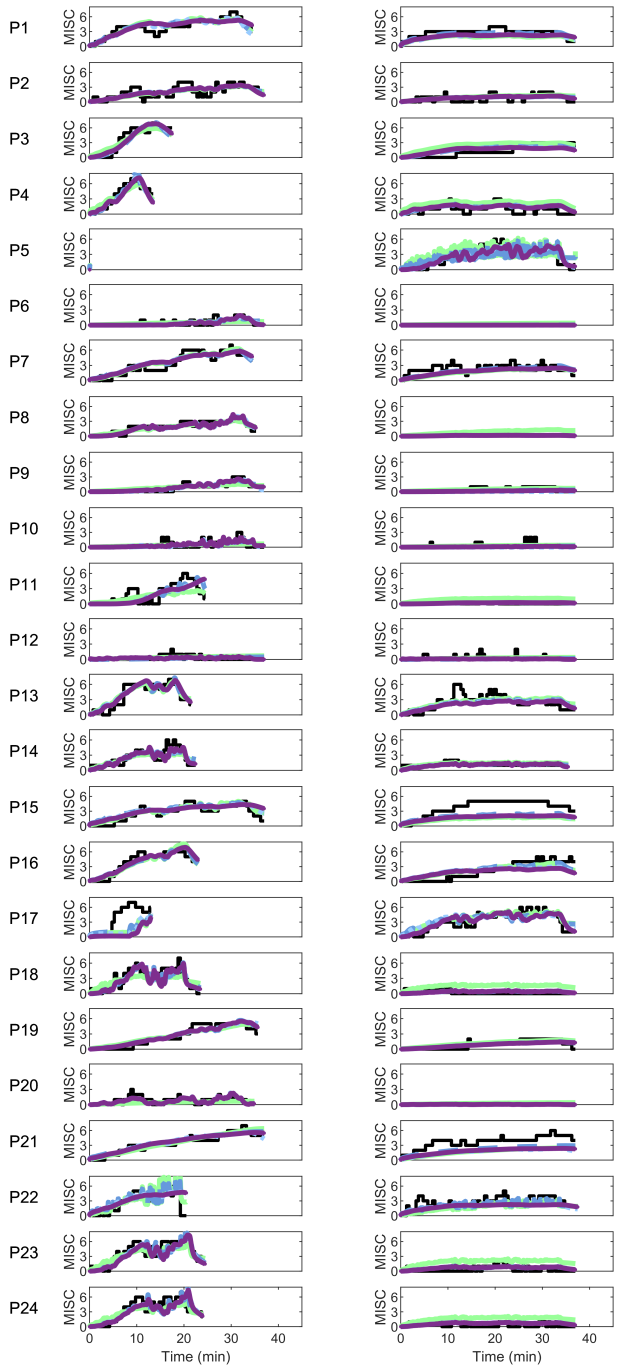

Figure 5b. AM3, AM4a, Am4b, AM5

Figure 5. Motion sickness responses (MISC) in Car and Simulator by Talsma et al. (2023); experiment in black, fitted AM0 in grey, AM1a in dashed red, AM1b in dotted light red, and AM2 in green, AM3 in light green, AM4a in dashed blue, AM4b in dotted light blue, and AM5 in violet for all participants (participant label shown on the left) for the conditions of internal (left column) and external (right column) vision.

Figure 6a. AM0, AM1a, Am1b, AM2

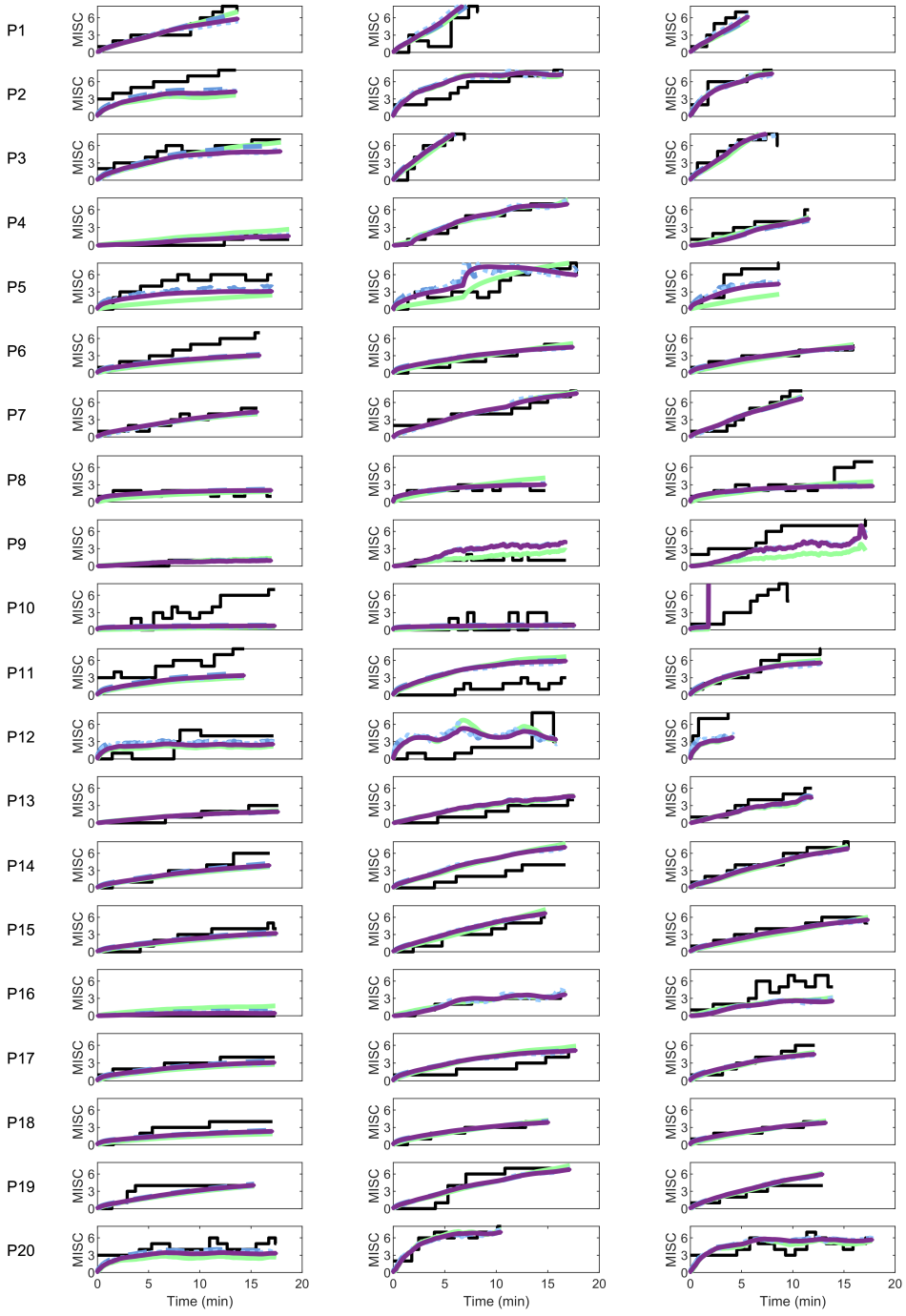

Figure 6b. AM3, AM4a, Am4b, AM5

Figure 6. Motion sickness responses (MISC) in NDRT Drive by Metzulat et al. (2024); experiment in black, fitted AM0 in grey, AM1a in dashed red, AM1b in dotted light red, and AM2 in green, AM3 in light green, AM4a in dashed blue, AM4b in dotted light blue, and AM5 in violet for all participants (participant label shown on the left) for the conditions of internal (left column) and external (right column) vision.

3 PARAMETER DISTRIBUTION MODEL

A 3-component Gaussian Mixture Model (GMM) in 2 dimensions can be expressed mathematically as a weighted sum of three Gaussian distributions. The model is given by:

$$p(\mathbf{x}) = \sum_{j=1}^{3} \pi_j \mathcal{N}(\mathbf{x}|\boldsymbol{\mu}_j, \boldsymbol{\Sigma}_j)$$

Where:

- $p(\mathbf{x})$ is the probability density function of the GMM. - π_j is the weight of the j-th Gaussian component, satisfying $\sum_{j=1}^{3} \pi_j = 1$. - $\mathcal{N}(\mathbf{x}|\boldsymbol{\mu}_j, \boldsymbol{\Sigma}_j)$ is the Gaussian density function, defined as:

$$\mathcal{N}(\mathbf{x}|\boldsymbol{\mu}_j, \boldsymbol{\Sigma}_j) = \frac{1}{2\pi|\boldsymbol{\Sigma}_j|^{1/2}} \exp\left(-\frac{1}{2}(\mathbf{x}-\boldsymbol{\mu}_j)^\top \boldsymbol{\Sigma}_j^{-1}(\mathbf{x}-\boldsymbol{\mu}_j)\right)$$

In this expression, $\boldsymbol{\mu}_j$ is the mean vector of the j-th Gaussian component, and $\boldsymbol{\Sigma}_j$ is the 2x2 covariance matrix.

4 DISCRETISED PREDICTIONS

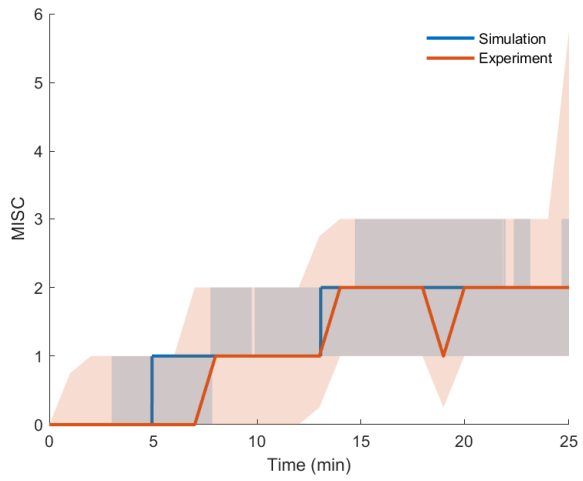

Figure 6a. On Road

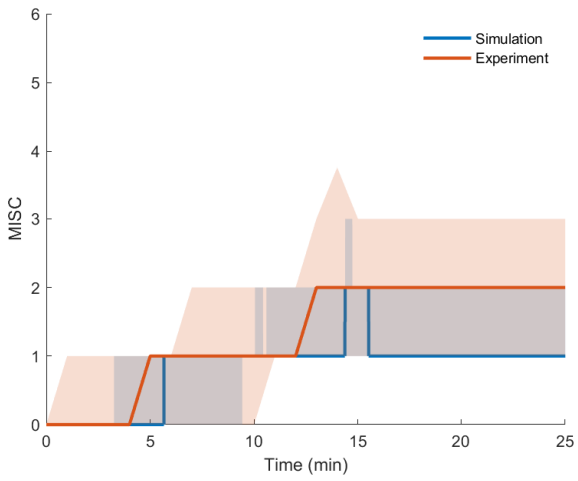

Figure 6b. On Track

Figure 6. Experimentally reported MISC and discretised Predictions of MISC on the 'Sickness recreation' dataset (Harmankaya et al., 2024) from sampled parameter sets from the probability density function of the parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM2 model.

5 PARAMETER DISTRIBUTION

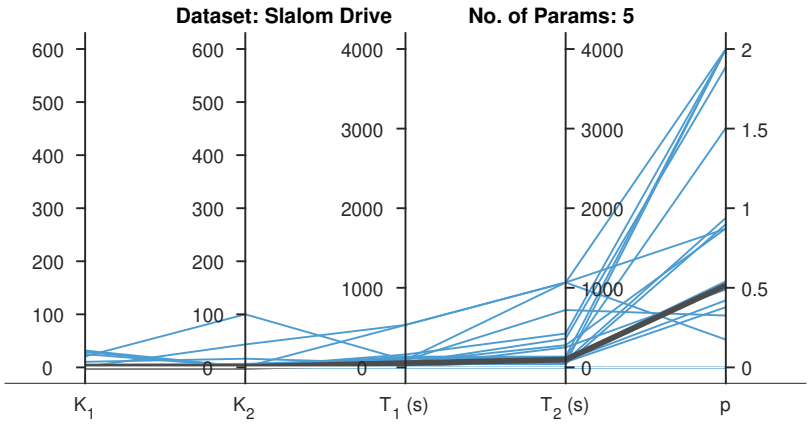

Figure 7a. Slalom drive dataset

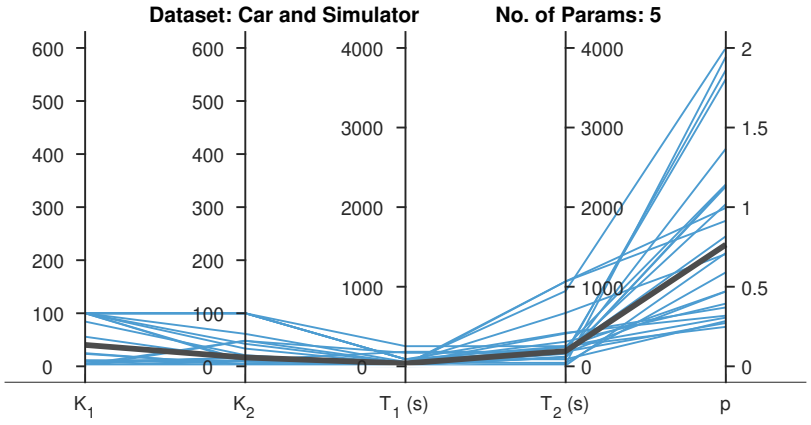

Figure 7b. Car and Simulator dataset

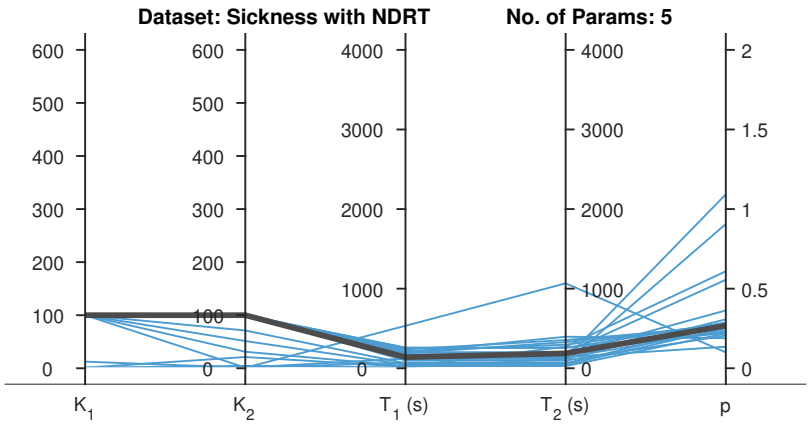

Figure 7c. NDRT Drive dataset

Figure 7. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM5 model (blue) with median values (black) for the three datasets

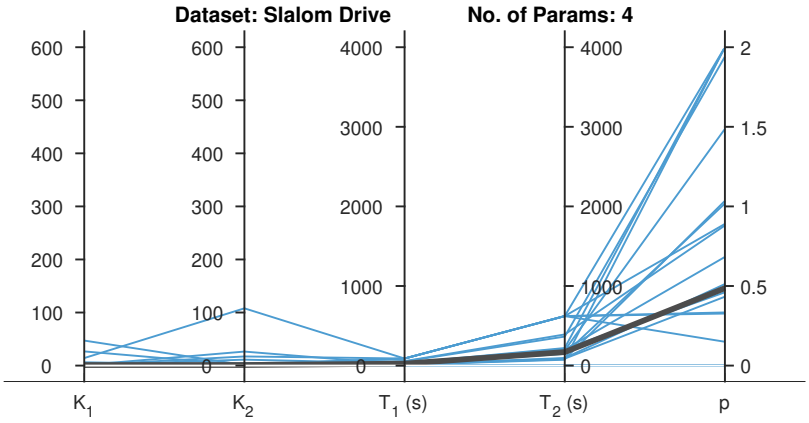

Figure 8a. Slalom drive dataset

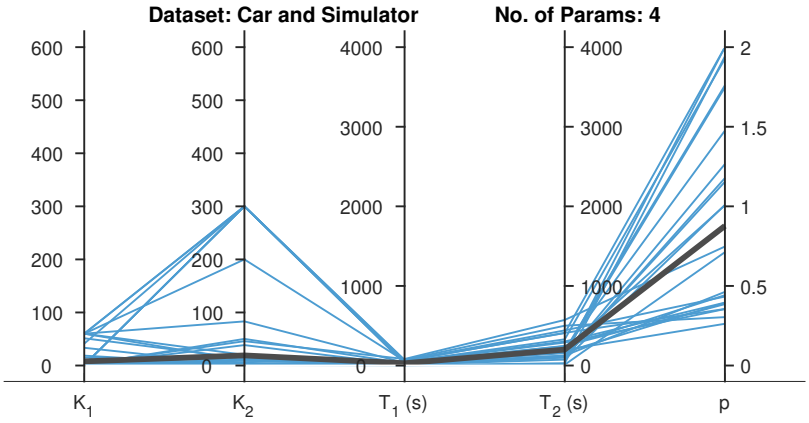

Figure 8b. Car and Simulator dataset

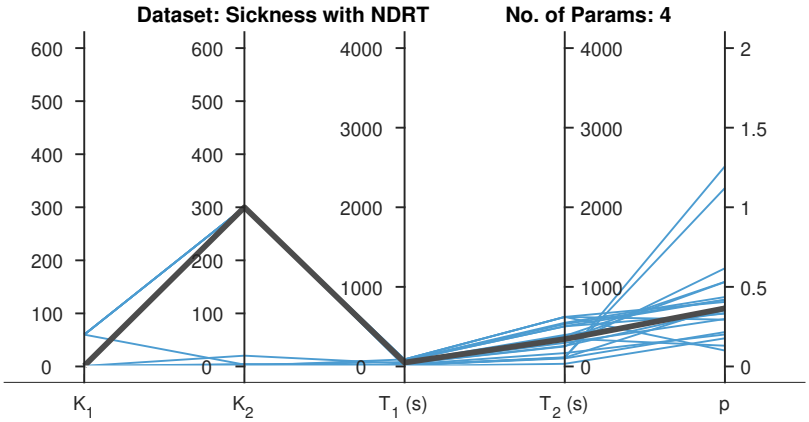

Figure 8c. NDRT Drive dataset

Figure 8. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM4b model (blue) with median values (black) for the three datasets

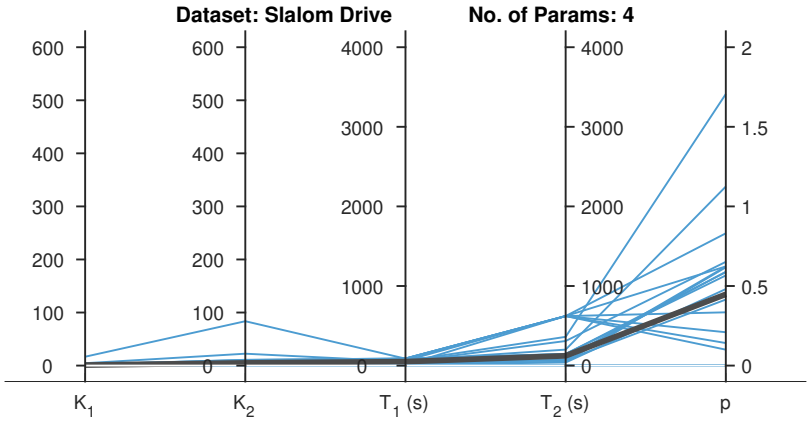

Figure 9a. Slalom drive dataset

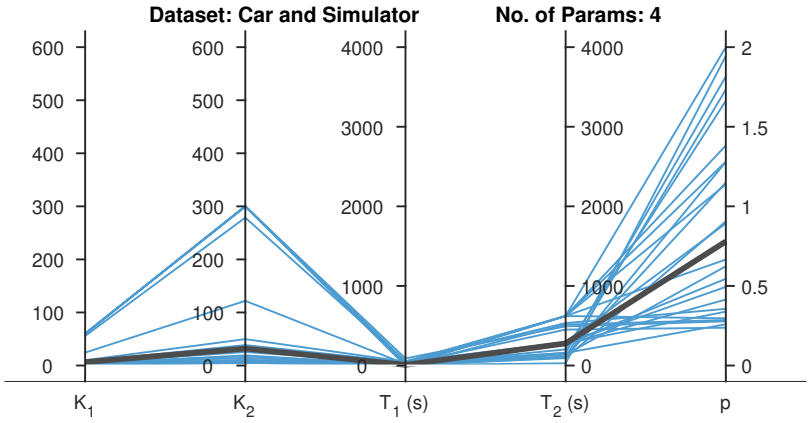

Figure 9b. Car and Simulator dataset

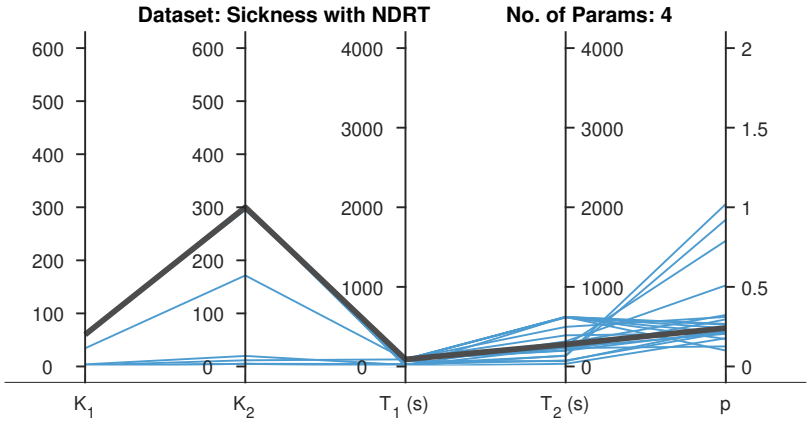

Figure 9c. NDRT Drive dataset

Figure 9. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM4a model (blue) with median values (black) for the three datasets

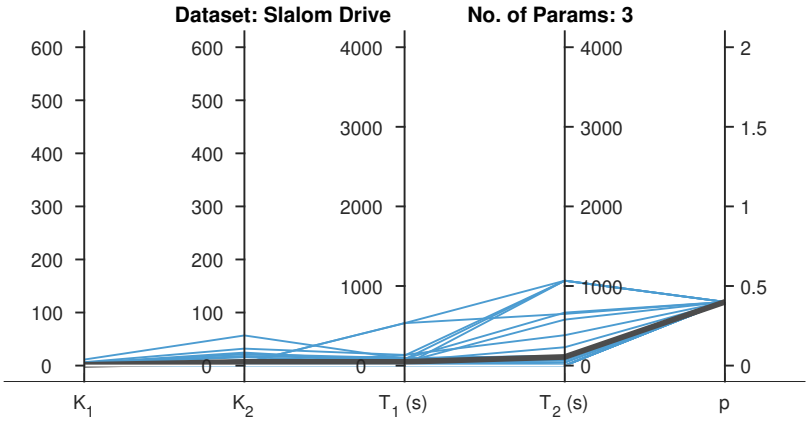

Figure 10a. Slalom drive dataset

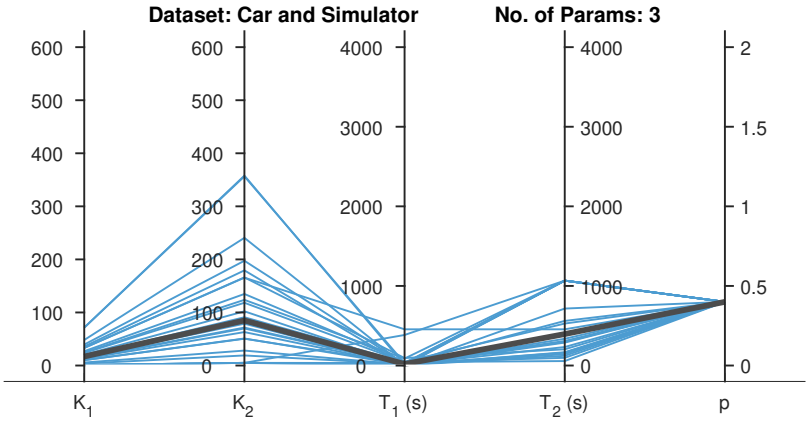

Figure 10b. Car and Simulator dataset

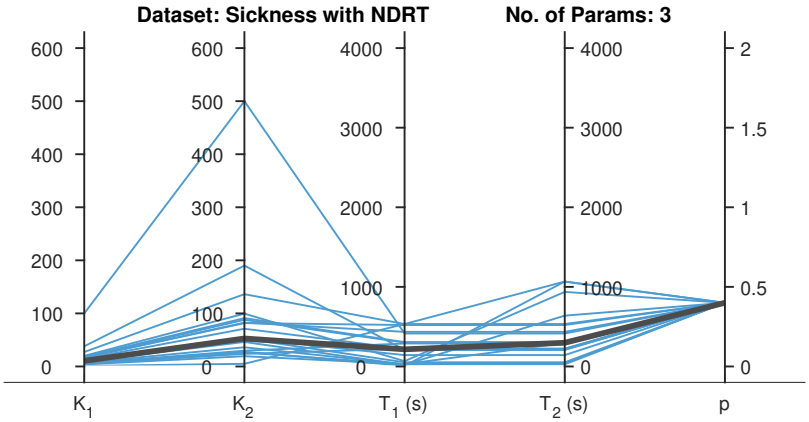

Figure 10c. NDRT Drive dataset

Figure 10. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM3 model (blue) with median values (black) for the three datasets

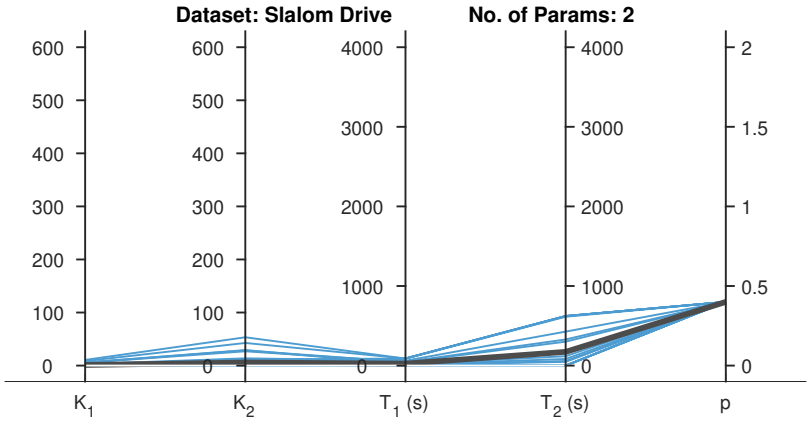

Figure 11a. Slalom drive dataset

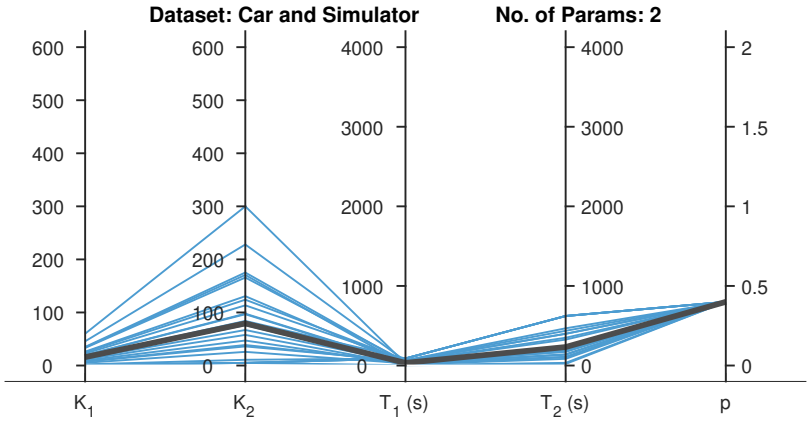

Figure 11b. Car and Simulator dataset

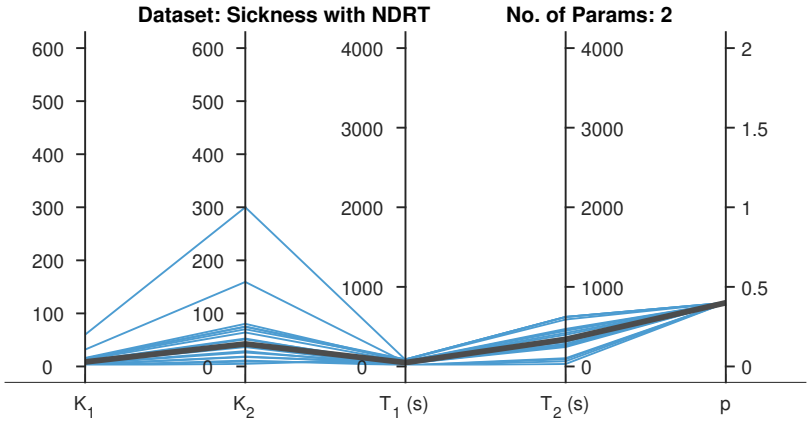

Figure 11c. NDRT Drive dataset

Figure 11. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM2 model (blue) with median values (black) for the three datasets

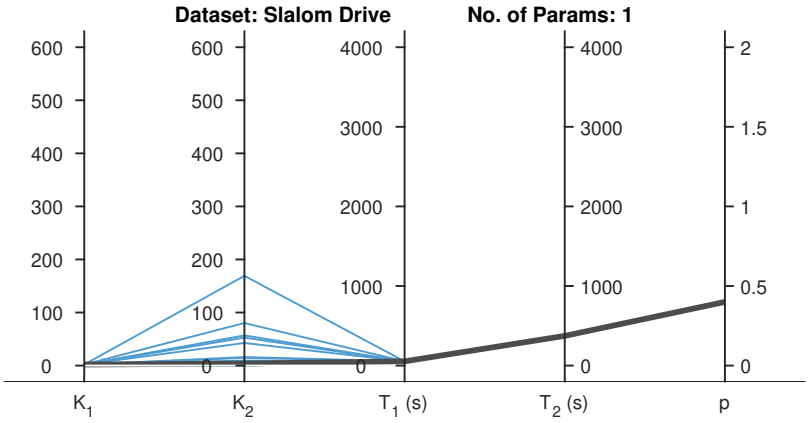

Figure 12a. Slalom drive dataset

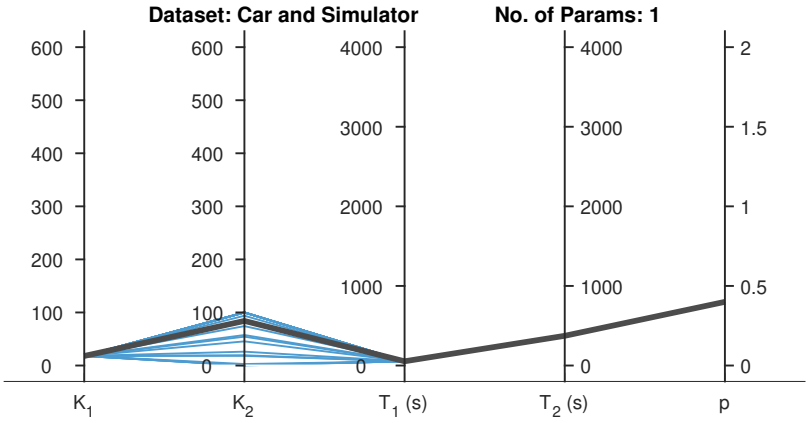

Figure 12b. Car and Simulator dataset

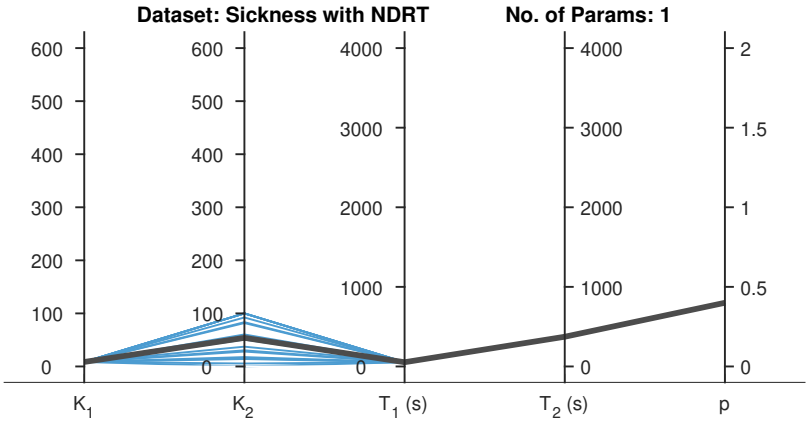

Figure 12c. NDRT Drive dataset

Figure 12. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM1b model (blue) with median values (black) for the three datasets

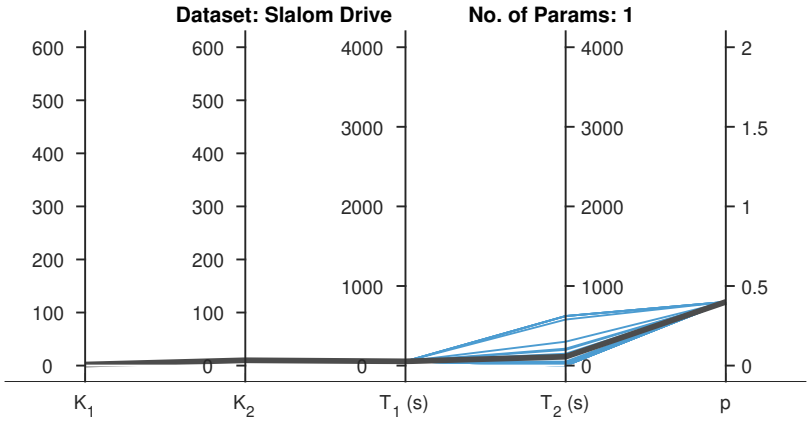

Figure 13a. Slalom drive dataset

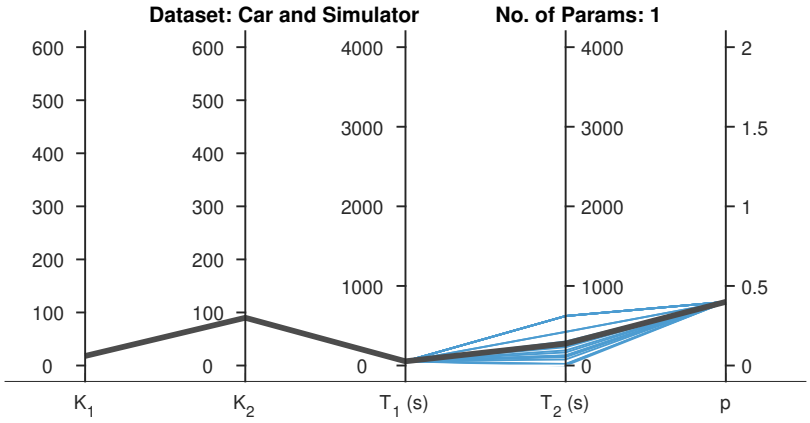

Figure 13b. Car and Simulator dataset

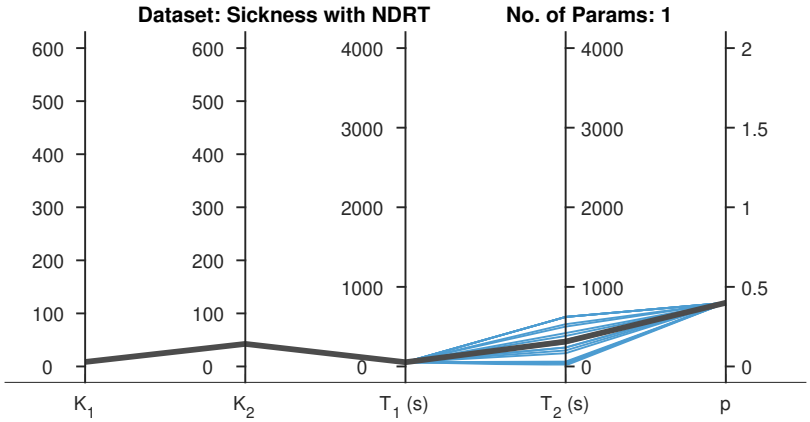

Figure 13c. NDRT Drive dataset

Figure 13. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM1a model (blue) with median values (black) for the three datasets

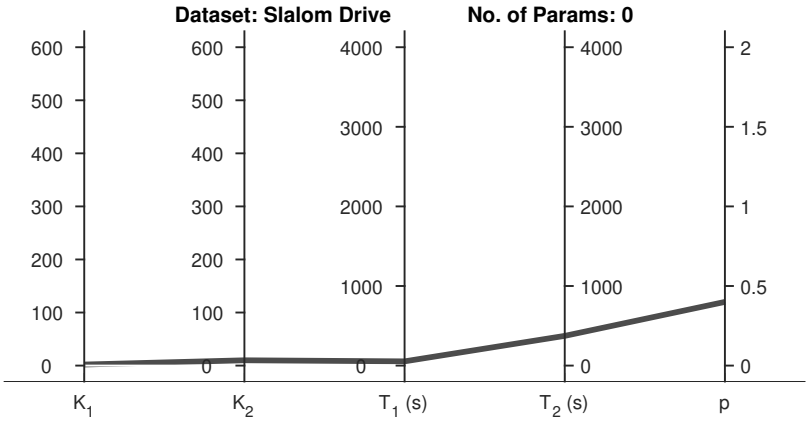

Figure 14a. Slalom drive dataset

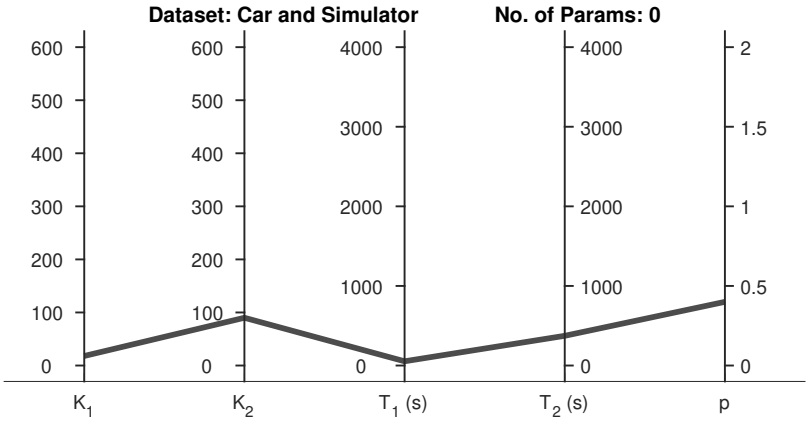

Figure 14b. Car and Simulator dataset

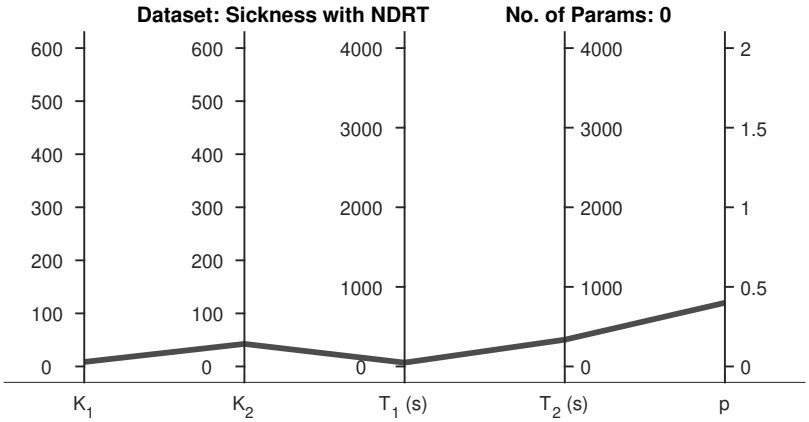

Figure 14c. NDRT Drive dataset

Figure 14. Parameter distribution (estimated gain (K_1) and time constant (T_1)) for the AM0 model (blue) with median values (black) for the three datasets

6 MISERY SCALE (MISC)

The MIsery SCale (MISC) for motion sickness is an established subjective measure from 0 to 10 used to quantify the severity of discomfort experienced during motion sickness based on symptoms such as nausea, dizziness and general feeling of unwell (Bos et al., 2005). It has now been rebranded as the Motion Illness Symptoms Classification (MISC) scale (Reuten et al., 2021).

Table S1. MIsery SCale (MISC) as described in Bos et al. (2005)

Symptoms		Score
No Probliems		0
Slight discomfort but no specific symptoms		1
Dizziness, warm, headache, stomach awareness, sweating, etc.	vage	2
	some	3
	medium	4
	severe	5
Nausea	some	6
	medium	7
	severe	8
	retching	9
Vomiting		10

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